Management of Giant Retrocerebellar Arachnoid Cysts With Intracranial Monitoring of Ventricular and Cyst Pressure Gradients Followed by a Cysto-Ventricular Stent

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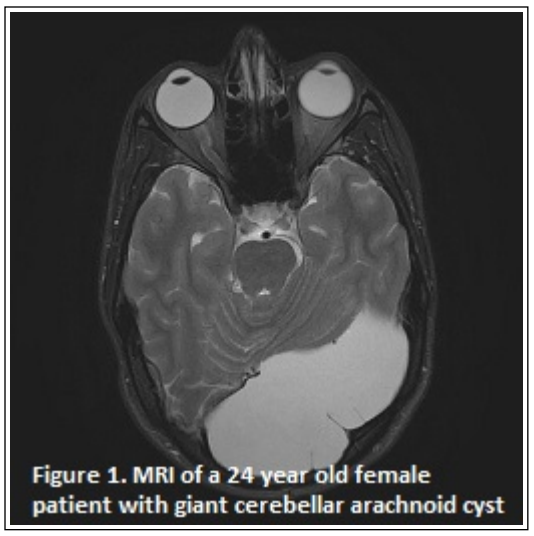

Figure 1. MRI of a 24 year old female patient with giant cerebellar arachnoid cyst

Introduction

Treatment options for symptomatic giant retrocerebellar arachnoid cysts (AC) are variable and provide inconsistent outcomes for patients seeking relief from headaches and other symptoms. This outcome discrepancy may be related to a lack of understanding of the pathogenesis leading to the headaches and other symptoms. When there are clear signs of increased ICP or hydrocephalus, there is little debate when surgery is indicated, especially in the case of large retrocerebellar or suprasellar cysts. However, there is less consensus when headache, dizziness, and other symptoms are the primary symptoms from the AC. Multiple authors have advocated the connection of arachnoid cysts to the ventricular system in order to create physiologic normalization of intra-cystic pressures [1,2,3,4,5]. The senior author has used acetazolamide challenge as a tool to help predict surgical outcome for patients with AC [6]. However, there has only been one report of using ICP monitoring to help make surgical decisions for treatment of arachnoid cysts [7]. We aimed to better understand the intracystic and intraventricular pressures and their relationship, as well as to improve symptoms by means of equalizing pressure gradients through the placement of a cysto-ventricular stent (CVS, a valveless shunt tubing between the two compartments).

This is the first study to describe prolonged monitoring of intracystic and intraventricular pressures done prior to the placement of a cysto-ventricular stent.

Methods

We retrospectively analyzed data from 3 patients with giant retrocerebellar arachnoid cysts from January 1, 2012 to June 30, 2016. In all three, intracranial pressures from the cyst and one lateral ventricle were monitored independently and simultaneously. Subsequently, a stent connecting the cyst to the ventricles was inserted.

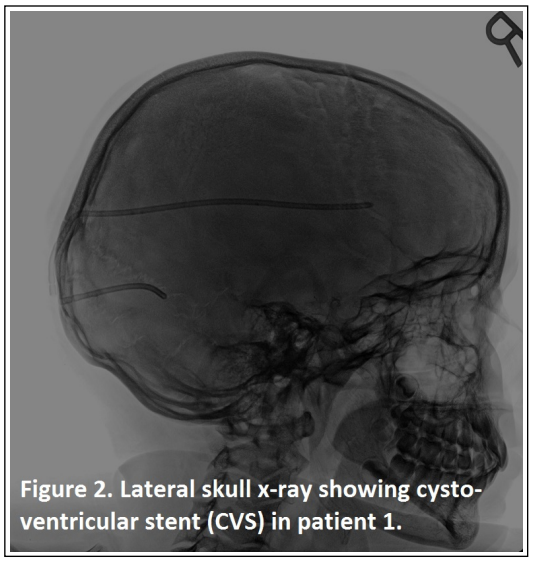

Figure 2. Lateral skull x-ray showing cysto-ventricular stent (CVS) in patient 1.

Surgical technique

Patients were taken to the operating suit where two separate burr holes were drilled in the parietal and occipital bone, and two ventricular catheters (Codman proximal ventricular bactiseal impregnated catheter) inserted separately under navigation guidance, one to the right lateral ventricle and one to the arachnoid cyst. A small piece of Duragen was placed in the burr hole around the catheters to prevent CSF leakage around them since the drains were planned to be clamped during the monitoring period. Both catheters were tunneled out through the skin separately, fixated to the skin with silk sutures, and connected to a monitoring probe and draining bag. Intracranial monitoring began as soon as the patients returned to their room in the PICU and special care units. After a period of 3 days of monitoring, the patients were taken back to the operating suit, where both catheters were connected under the scalp with two 90 degree connectors.

Results

Two patients demonstrated pressure gradient differences at some point during the monitoring period or with a head position change. In patient 1, the cyst pressure increased compared to ventricular pressure. In patient 2, the cyst pressure did not change, rather the ventricular pressure increased in upright position and decreased after drainage of 10ml of fluid from the cyst. Patient 3 showed no pressure differences. All three patients underwent stent placement between the ventricle and cyst. Patients 1 and 2 reported significant improvement of their headaches while patient 3 reported no improvement. Patient 1 and 2 had their last follow up in April 2016, and patient 3 in June 2016.

Patient	Age/S	Prior procedures	ICP gradient	Result
1	10M	• *endoscopic marsupialization of cyst* • *cysto-peritoneal shunt* • *frontal parenchymal ICP monitoring and ligation of distal shunt due to overshunting*	• *cyst pressure was higher than lateral ventricle in all positions.* • *Valsalva disproportionally increased intracystic pressure*	*Significantly improved*
2	24F	• *endoscopic fenestration of the arachnoid cyst*	• *No change in cyst pressure in different positions and after drainage of 10ml of fluid* • *Ventricular pressure increased in upright position, but decreased after cyst drainage*	*Headaches resolved*
3	47F	• none	• *No pressure gradient in any position or with Valsalva*	*No improvement*

Table 1. Patient characteristics, ICP gradients, and results

Conclusion

Symptomatic retrocerebellar arachnoid cysts are difficult to treat. We observed that the two patients who had pressure gradient differences between the arachnoid cyst and ventricular system had significant symptomatic improvement after placement of a CVS. One patient who did not have a gradient did not have improvement after stenting the cyst. In our patients, it appears a stent bridging the two compartments may offer a more physiologic treatment option compared to cystoperitoneal shunt and possibly more durable that simple cyst fenestration. Long term followup and further ICP monitoring in additional patients may shed more light in understanding which patients may benefit from this technique.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of simultaneous monitoring of ICP and cyst pressures in giant retrocerebellar arachnoid cyst, 2) Discuss, in small groups the patient selection, feasibility, and technical aspect of the cysto-ventricular shunt, 3) Identify an effective treatment for giant retrocerebellar arachnoid cyst using the cysto-ventricular shunt.

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